

*On an Ancient Human Footprint from Nicaragua.*

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*(Read before the American Philosophical Society, Nov. 18th, 1887.)*

The discovery of human footprints in volcanic rocks near the shore of Lake Managua, Nicaragua, under circumstances which seemed to assign them a remote antiquity, has been announced for several years.\* We owe thanks especially to Dr. Earl Flint, of Rivas, Nicaragua, for information about this discovery, and for sending several specimens to the United States. Four of these are in the Peabody Museum of Archæology, Cambridge, and recently, I have myself received one from Dr. Flint, together with several letters describing the locality. The possession of this material has induced me to present, along with its description, a general review of the subject.

The surface of the Republic of Nicaragua presents in nearly all parts the signs of enormous volcanic activity. It is broken by a complex series of mountain ranges whose sides are scored with vast lava streams. Frequent earthquakes attest the continued energy of the subterranean forces and prepare us for incidents of elevation and subsidence on an uncommon scale.

The great lakes of Nicaragua and Managua are divided by a low plain through which flows the river Tipitapa connecting these sheets of water. South of this lowland rises a mesa or tableland 400 or 500 feet above the level of the lakes, and upon this stand the volcanic cones of Mombacho (4588 feet) and Masaya (2972 feet). Beyond these, the land still rising, reaches its height in the Sierras de Managua, presenting the craters of the extinct volcanoes of Tizcapa, Nezcapa (Nehapa), and Asososco; and further to the north-west, immediately upon the shores of the Lake Managua, the still smoking peaks of Chiltepec (2800 feet) and Momotombo (6121 feet). -

The last named (Momotombo) was active in 1852, and Masaya in 1858 and 1872, while Mombacho, though quiet, so far as we know, since the conquest, according to tradition, destroyed an important town just before that epoch, and its sides still reveal signs

\* The following are the principal references: Letter of Dr. Flint, dated Jan. 7, 1881, in the *American Antiquarian*, March, 1881; *17th Report of the Peabody Museum* for 1884, page 356; *18th Report of the same*, 1885, page 411; *Proceedings of the American Antiquarian Society*, 1881, p. 92. Letter of Dr. Flint in *American Antiquarian*, May, 1885.

of terrific outbursts at no distant date. In the eruption of March, 1872, Masaya vomited a lava stream two miles in width.\*

I quote these facts to show the volcanic character of the country and the powerful agencies at work there.

For our present purpose, we have to confine our attention to the extinct volcano of Tizecapa. Like its neighbors, the cones of Nezcapa and Asososco, it has long since burnt out its fires, and all three have changed their flaming craters into deep and still lakes, encircled by precipitous walls of congealed masses. Tizecapa is about two and a-half miles from the shore of Lake Managua, and in ancient times its molten streams found their way into the waters of the lake. Its eruptions were irregular, and evidently long periods of quiescence intervened between those of violent action, periods extended enough to allow the earlier tufa beds and lava streams to become covered with vegetation, the relics of which we find imbedded beneath later overflows. How much time this would require is a vital question in deciding the age of the footprints. These are found on the surface of the *first* or lowest tufa bed, which itself rests upon a bed of yellow sand.

Before proceeding to a discussion of the antiquity we may fairly assign to the relic, I shall insert Dr. Flint's description of the locality, and add a vertical section of the cutting in the quarry on the lake shore, in which the footprints are found. Both of these he has kindly sent me in a recent letter.

"The Cordilleras east of Lake Nicaragua are a continuous succession of low mountains, spread out and gradually diminishing to the depression, where the outlet of Lake Nicaragua passes seaward by the San Juan river. In past ages the spur west of the lakes Nicaragua and Managua (formerly part of an ocean inlet) was the theatre of volcanic action seldom exceeded; and its latent fires, out of the axial line, at Ometepetec and Momotombo, still smoke. These magnificent cones may continue to burn for ages, until they disappear, like their neighbors, leaving like them, an abyss to mark their location.

"Zapatero has its deep lake, whose surface is but slightly above the waters of the one surrounding it; north-west and near Granada, we look down from the edge of the old crater on a

\* See Pablo Levy, *Notas sobre la Republica de Nicaragua*, pp. 83, 84 (Paris, 1873), and A. Schiffman, *Una Idea sobre la Geolojia de Nicaragua*, p. 125 (Managua, 1873).

placid lake, whose four square miles of water are seldom stirred by the wind, and whose depth has not yet been fathomed. When were the fires of this immense crater extinguished?

“Lake Masaya far exceeds that of Apoyo; as we descend the deep ravines cut through the tufas to its margin, we see the work of centuries carrying back this detritus to refill the abyss, and no perceptible diminution is noted. Passing on, we find the lakes Nehapa, Asososco, and Tizcapa, under similar conditions; the latter near Managua, furnished the material forming the tufas on which the footprints occur.

“These lakes at the time of the Spanish occupation, now nearly four centuries, presented nearly the same aspect as they do now; their rock-bound shores were covered with inscriptions, of which no tradition could be obtained of the tribes then occupying this region. The country was clothed with impenetrable forest that had sprung up on these arid wastes of tufa. We dig below this fertile soil, and after removing five well-marked beds of tufa, including a lower one of pure ash, we encounter a deposit of clay, a soil of other times, accumulated under circumstances familiar to that now on the surface. It also had its plants and trees. Among the former we see long liriaceous leaves impressed on the friable deposit. We ask, is this the soil of the first inhabitants? Before deciding, we dig below, through four more deposits, with other accumulations in the seams, of pumice and volcanic sand. We reach a thin friable tufa, nearly black, about two inches thick; removing it, we find a heavy deposit of tufa lying on yellow sand. This is the last in the series; on its upper surface we find innumerable footprints of a people who had passed over it, at different times, when in a plastic state. Some sank deep in the mass, while others left superficial impressions. Now and then, a stray leaf of that horizon was trodden into the imprints; others are on the friable under-surface; they seem to differ from those above under the ash.”

Dr. Flint sends me a vertical section of the quarry from which the present specimen was taken. The location is about 300 feet from the shore and close to the town of Managua. At that point the overlying strata present a thickness of twenty-one feet beneath the surface soil, the most of the mass being compact tufa, similar in general appearance to the block bearing the imprint.

*Vertical section, 21 feet in depth, of a Quarry on Lake Managua, showing strata overlying human footprints.*

1	1. Surface soil, about 18 inches.
2	2. Compact tufa, 20 inches, separated from No. 3, by a sand seam.
3	3. Compact tufa, 20 inches, separated from No. 4 by a sand seam.
4	4. Compact tufa, 17 inches, separated from No. 5 by a sand seam.
5	5. Compact building tufa, 28 inches, resting on a seam of black sand.
6	6. Solid, dark-blue ash, 14 inches.
7	7. Hard clay, 12 or more inches, its surface presenting numerous leaves (impressions, fossils), and remains of the mastodon.
8	8. Pumice, about two inches, unequally distributed.
9	9. Sand drift, supporting the clay.
10	10. Compact building tufa, 47 inches, separated from No. 11 by a sand seam.
11	11. Compact tufa, 5 to 7 inches.
12	12. Black sand, 1 inch.
13	13. Dark, friable tufa, 2 inches.
14	14. Volcanic sand, containing fossil leaves, 1 inch.
15	15. The dotted line ..... shows the horizon of the footprints impressed upon number
16	16. Compact building tufa, 47 inches.
17	17. Yellow sand, believed to be Eocene (?) of undetermined thickness, containing numerous small shells.

Beginning with the lowest stratum, the yellow sand, the only clue offered to ascertain its age, believed by Dr. Flint to be Eocene, is the shells which it offers in abundance, but apparently only of one species. They are small and well preserved. Dr. Flint transmitted a number of them for examination to Prof. Newcombe, of Cornell University, who considered them a new species, and has called them provisionally *Pyrula nicaraguensis*, and adds that the genus is represented in North America by but one other species, *P. nevadensis* Stearn.

I submitted a number of them to my colleague at the Academy of Natural Sciences, Prof. Angelo Heilprin, who writes me:—"I should not like to pronounce positively upon the age of the deposit represented by the Nicaraguan shells, as by themselves they scarcely give direct evidence. But I should incline to the opinion that the deposit in question is more nearly Post-pliocene than Eocene, the specimens having a decidedly new look, and lacking the Eocene tertiary characters."

Dr. Flint sent to the Peabody Museum a number of leaves from the deposit marked 14 on the section; and I have recently inquired of the authorities of the Museum whether their age and character have been determined. They reply, that these characters have not yet been made out.

The hard clay deposit, No. 7 of the plan, increases in thickness in other localities to ten or twelve feet. It is considered by Dr. Flint to represent a period of repose of many centuries, and on its surface, bones of the mastodon have been found at other points along the lake. It is the only deposit in the section which seems to demand considerable time; and even here, the question will suggest itself whether a submergence of the lake shore for a few centuries or less might not be sufficient to produce this deposit. The presence of the mastodon bones is no evidence of great antiquity. That huge herbivore lived in tropical America almost in historic times. A complete skeleton of one was found not long since in an *artificial* salt pond, constructed by the Indians, near Concordia, Colombia. The pond, with its bottom of paved stones together with the animal, had been entombed by a sudden landslide.\*

\* See R. B. White, "Notes on the Aboriginal Races of the Northwestern Provinces of South America," in the *Journal of the Anthropological Institute of Great Britain*, February, 1884, p. 244.

The deposit of ashes, No. 6 on the section, is held by Dr. Flint to mark a period of volcanic energy of wide extent and important consequences in modifying the physical geography of the region. It led to the elevation of the coast range and the separation of Lake Nicaragua, previously a bay of the ocean, from the sea. Dr. Flint's expressions are :

“ West of Jinotepe a well was sunk one hundred and nineteen varas in search of water; there this ash deposit is fifteen feet thick, at least twenty miles from the nearest crater.

“ We see many proofs, that the cataclysm enclosing Lake Nicaragua (formerly salt water) was at the time of this ash eruption; while the tufas, *previously ejected*, pushed over the sea inlet at Tipitapa, enclosing that of Managua; they were not broken up by the cataclysm, nor those at the quarry, and all on the northern slope; nor the slip of coast north and south of San Rafael.”

Passing to a study of the tracks themselves, they are described by Dr. Flint as quite numerous and passing in both directions, that is, to and from the lake shore, from which the average distance of those found is about 300 feet. The maximum stride was 18 inches, and the longest foot measured 10 inches.

The specimen which he has sent me, and which is offered for inspection [specimen presented], is the impression of a left foot. The total length of the impression is  $9\frac{1}{2}$  inches, the breadth at the heel 3 inches, at the toes  $4\frac{1}{2}$  inches. The apparent length of the foot itself was 8 inches. The instep was high, and the great toe large, prominent and exceeding in length the second toe. This last peculiarity has been by some considered of ethnic importance.\* The greatest depth of the impression is at the ball of the foot, the weight being evidently thrown forward as in vigorous walking. At this part the maximal depression below the plane of the superficies is 2 inches.

The footprints on the tufas at Managua are not the only ones discovered in that Republic by Dr. Flint. Others were seen on the southern slope of the Sierra de Managua, near the town of

\* See J. Park Harrison, “ On the Relative Length of the First Three Toes of the Human Foot,” in the *Journal of the Anthropological Institute of Great Britain*, February, 1884. The general conclusion seems to be that a long second toe indicates a lower stage of development.

San Rafael. The character of this horizon is thus described by Dr. Flint in a letter to me :

“ Collateral evidence touching man’s antiquity here, not less weighty, is found in the neighborhood. The eruptions covering the south-west slope, and the disturbance caused by one, along the ocean beach, elevating the coast range, affords us indisputable evidence of Pliocene man. In descending the slope through immense ravines formed by the annual floods, we see enormous blocks of tufa, isolated by the removal of the material surrounding them, showing that they had been uplifted by some mighty force and re-embedded in the resultant débris.

“ In 1875-8 and 1883, I spent over a month visiting the coast-hills to the south-west about San Rafael, seeking out the limits of the cataclysm.

“ A strip of land, commencing at Bocano, extends along the coast about forty miles and widens out about San Rafael, terminating some eighteen miles above the latter place, at the base of the old primitive range. South-east of the town, a notable break in the upheaval shows that this strip was undisturbed, while the succession of hills to the east and south-east widens out and extends to the south at San Juan del Sur, and thence to Salinas bay. The force culminated against the south-west slope of the old primitive volcanoes mentioned, also shown north-west of San Rafael, where the tufa of the first eruption, on the slip of land mentioned, was unbroken, while in ravines near, the ocean sediment of the upheaval overrides it, forced over it as the rise occurred near by to the east.

“ This sediment has been carried seaward by the rivers since formed. As they removed the débris from the tufa, these were found covered with footprints of animals and man. One of these (sandal shod) was forwarded to the Peabody Museum.

“ Where the rivers have cut through the old sea sediment down to the primitive rock, we see beds of shells of many species, among them enormous oysters of an oblong figure, perfect fossils, yet unnamed. They are *in situ*. Their contents resemble slaked lime. All this shows a sudden elevation. A few can be seen at the National Museum with the fossil leaves in the rock above them, similar to those on the Managua clay under the ash eruption. The latter eruption broke up the clay and elevated the



coast range. On the neighboring hills innumerable shells are adherent to the fractured limestone, and south to those west of Rivas; from there the limestone dips to south-east and is only about sixty metres above the sea between San Juan and Virgin bay, while part of the Rivas plateau was undisturbed."

It will be observed that one of these footprints indicates the use of sandals or moccasins by the pedestrians of that day. None of this character have been reported from Managua. Undoubtedly a society which wears shoes cannot be assigned to the earliest stages of human culture. Many of the natives of Central America to this day never protect the feet in any manner.

In conclusion, I should say, that there can be no doubt of these being genuine human footprints. They are not of that mythical origin which the fancy of savage nations delights to imagine,\* nor can there be the least doubt of their authenticity. Their antiquity remains uncertain. In regions at once tropical, fertile and volcanic, we may expect sudden upheavals and subsidences, and the ravages of the most violent outbursts are repaired by a luxuriant vegetation with surprising rapidity. My own opinion is, that there is not sufficient evidence to remove them beyond the present Post-pliocene or Quaternary period.

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*Stated Meeting, December 16, 1887.*

Present, 27 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows: Letters of envoy were received from Société R. des Sciences à Upsal; Fondation de P. Teyler van der Hulst à Harlem; Società Italiana della Scienze, Torino; Lords Commissioners of the Admiralty, London; U. S. Naval Observatory, U. S. Geological Survey, Washington, D. C.

A letter from Lord Rayleigh, London, acknowledging receipt of his diploma.

A letter was read from Prof. March, Easton, Pa., in refer-

\* See Dr. Richard Andree, on "Fussspuren," in his *Ethnographische Parallelen und Vergleiche*, s. 94 (Stuttgart, 1878).